(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
30 June 2005 (30.06.2005)

PCT

(10) International Publication Number
WO 2005/060031 A2

(51) International Patent Classification[7]: H01M 8/02, 8/04, 8/10

(21) International Application Number:
PCT/EP2004/014420

(22) International Filing Date:
17 December 2004 (17.12.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
MI2003A002531
19 December 2003 (19.12.2003) IT

(71) Applicant *(for all designated States except US)*: **NUVERA FUEL CELLS EUROPE S.R.L.** [IT/IT]; Via Bistolfi, 35, I-20134 Milan (IT).

(72) Inventors; and

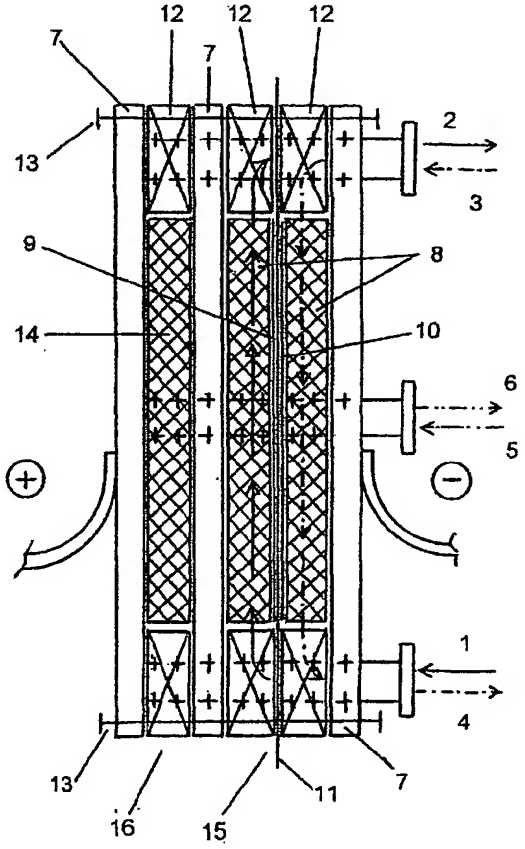
(75) Inventors/Applicants *(for US only)*: **FAITA, Giuseppe** [IT/IT]; Via Rivolta, 15, I-28100 Novara (IT). **TORO, Antonino** [IT/IT]; Via Morandi 17, I-20090 Segrate (IT). **MERLO, Luca** [IT/IT]; Via Molera, 12, I-22030 Montorfano (IT). **XUE, Zhi, Yang** [CN/US]; 56 Russell Street, Malden, MA 02148 (US).

(74) Agent: **REITSTÖTTER, KINZEBACH & PARTNER (GBR)**; Sternwartstrasse 4, 81679 München (DE).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

[Continued on next page]

(54) Title: MEMBRANE FUELL CELL COUNTERCURRENT-FED WITH NON-HUMIDIFIED AIR



(57) Abstract: The present invention describes a membrane fuel cell capable of operating in a stable fashion at high currently density under dry reactant gas feed at near-atmospheric pressure. This result is obtained by employing internal porous gas distributors, such as three-dimensional reticulated materials, sintered materials, juxtaposed meshes or expanded sheets, and at the same time by countercurrent-feeding the gas reactants, preferably ambient air, from the bottom. In one preferred alternative liquid water is injected from the bottom into the air feed: with these operating conditions, an extremely simplified stable functioning is obtained, since the air and water flow-rates, adjusted as requested for the maximum nominal electrical output, are kept unvaried even at low or zero output conditions without the cell membrane undergoing dehydration.

WO 2005/060031 A2

(84) **Designated States** *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *without international search report and to be republished upon receipt of that report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.